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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 March 2009*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 11-22* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 11-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set

forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this

application is eligible for continued examination under 37 CFR 1.114, and the fee set

forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action

has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on

3/31/2009 has been entered.

Claims 1, 7, 20 and 22 have been amended.

Stefan in view of Boariu and Buehrer clearly disclose:

receiving information in the form of data signal for transmission to a receiver (see

Stefan, fig.1, [page 1824: section A] (S/P receiving information)); and

splitting the data signal into a plurality of sub-carriers to at least partially

redundantly transmit the information over a multi-carrier wireless communication

channel (M antennas) (see Stefan, fig.1, [page 1824-1825] **after serial-to-parallel (S/P)**

conversion, each OFDM block processes *Ne/M* complex-valued data symbols out

of a sequence of Ne. Each of the M OFDM blocks maps its *Ne/M* data symbols on

its assigned set of subcarriers. The subcarriers of one block should be spread

over the entire transmission band-width in order to increase the frequency

diversity per block [7]. I.e, the subcarriers of the individual blocks should be

interleaved);

splitting each of the sub-carriers into N signals (see Stefan, **Each of the M**

OFDM blocks maps its *Ne/M* data symbols on its assigned set of subcarriers) one

for each of a plurality of antenna paths (see Stefan, fig.1, **M antennas**), wherein each of

the sub-carriers is to be transmitted over an array of N antennas using a different

antenna path for each signal (see Stefan, fig.1, [page 1824-1825]);

modifying each of the sub-carriers by a set of complex weights (see Stefan,

fig.1, [page 1824-1825] (**Each of the M OFDM blocks maps its *Ne/M* data symbols**

on its assigned set of subcarriers)), the sets of complex weights having a complex

weight for each antenna path (see Stefan, **Each of the M OFDM blocks maps its**

***Ne/M* data symbols on its assigned set of subcarriers**), to ensure that each of the N

signals of each sub-carrier of the wireless communication channel propagates along a

different physical path to the receiver (see Boariu, col.24, line 41 to col.25, line 13),

wherein the set of complex weights used to modify each of the sub-carriers (see Stefan,

fig.1, [page 1824-1825] (Each of the M OFDM blocks maps its *Ne/M* data symbols on its

assigned set of subcarriers)) includes different weights (see Burhrer, fig.1) for each

antenna path of the array (see Burhrer, [0091]).

Claim Rejections - 35 USC § 103

2.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-9 and 11-22 are rejected under 35 U.S.C.103(a) as being unpatentable

over Stefan (*Spatial Transmit Diversity Techniques for Broadband OFDM Systems*), in

view of Boariu et al. (U.S.Pat-6865237), and further in view of Buehrer (U.S.Pub-

20030081656).

Regarding claim 1, Stefan teaches a method comprising:

receiving information in the form of data signal for transmission to a receiver

(fig.1, [page 1824: section A] (S/P receiving information)); and

splitting the data signal into a plurality of sub-carriers to at least partially

redundantly transmit the information over a multi-carrier wireless communication

channel (M antennas) (fig.1, [page 1824-1825] after serial-to-parallel (S/P) conversion,

each OFDM block pro*cesses Ne/M* complex-valued data symbols out of a sequence of

Ne. Each of the M OFDM blocks maps its *Ne/M* data symbols on its assigned set of

subcarriers. The subcarriers of one block should be spread over the entire transmission

band-width in order to increase the frequency diversity per block [7]. I.e, the subcarriers

of the individual blocks should be interleaved);

splitting each of the sub-carriers into N signals (Each of the M OFDM blocks

maps its *Ne/M* data symbols on its assigned set of subcarriers) one for each of a

plurality of antenna paths (fig.1, M antennas), wherein each of the sub-carriers is to be

transmitted over an array of N antennas using a different antenna path for each signal

(fig.1, [page 1824-1825]);

modifying each of the sub-carriers by a set of complex weights (fig.1, [page 1824-1825] (Each of the M OFDM blocks maps its *Ne/M* data symbols on its assigned set of subcarriers)), the sets of complex weights having a complex weight for each antenna path (Each of the M OFDM blocks maps its *Ne/M* data symbols on its assigned set of subcarriers), to ensure that each of the N signals of each sub-carrier of the wireless communication channel propagates along a different physical path to the receiver (not show), wherein the set of complex weights used to modify each of the sub-carriers (fig.1, [page 1824-1825] (Each of the M OFDM blocks maps its *Ne/M* data symbols on its assigned set of subcarriers)) includes different weights for each antenna path of the array (not show).

Stefan fails to specifically disclose to ensure that each of the N signals of each sub-carrier of the wireless communication channel propagates along a different physical path to the receiver.

However, Boariu teaches to ensure that each of the N signals of each sub-carrier of the wireless communication channel propagates along a different physical path to the receiver (col.24, line 41 to col.25, line 13).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to teaching of Boariu to Stefan to reduce bit error rates of a wireless communication in a spread spectrum receiver.

Stefan and Boariu fail to specifically disclose different weights for each antenna path of the array.

However, Buehrer teaches different weights (fig.8) for each antenna path of the array ([0091]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to teaching of Buehrer to Stefan and Boariu to improve diversity in communication system by using Walsh codes.

Regarding claim 2, Stefan, Boariu, and Buehrer further teach a method according to claim 1, wherein each element of the set of complex weights scales (see Buehrer, fig.8) one or more of a sub-carrier's amplitude and/or phase at an associated transmission antenna (see Stefan, [pages 1824-1825], see Boariu, col.24, line 41 to col.25, line 13).

Regarding claim 3, Stefan, Boariu, and Buehrer further teach a method according to claim 1, further comprising developing a set of complex weights including:

choosing substantially different weights (see Buehrer, fig.8), for each sub-carrier sharing information (see Stefan, [pages 1824-1825], see Buehrer, [0091] lines 19-29); and iteratively repeating until all sub-carriers have been modified (see Boariu, col.24, line 41 to col.25, line 13).

Regarding claim 4, Stefan, Boariu, and Buehrer further teach a method according to claim 3, wherein the substantially different weights are chosen to be orthogonal to the others (see Stefan, [pages 1824-1825]).

Regarding claim 5, Stefan, Boariu, and Buehrer further teach a method according to claim 3, wherein developing a set of complex weights comprises: selecting weight

vector(s) to be applied to each of the sub-carriers from a pre-determined set of weight

vectors (see Stefan, [pages 1824-1825]).

Regarding claim 6, Stefan, Boariu, and Buehrer further teach a method according

to claim 1, further comprising: transmitting the modified sub-carriers ((see Stefan,

[pages 1824-1825]), see Buehrer, [0091] lines 19-29).

Regarding claim 7, Buehrer teaches a transceiver comprising:

a splitter module (fig.1 S/P), operable to receive a data signal for transmission to

a receiver (fig.1, [page 1824: section A] (S/P receiving information)), to split the data

signal into a plurality of sub-carriers to at least partially redundantly transmit the

information over a multi-carrier wireless communication channel (M antennas) (fig.1,

[page 1824-1825] after serial-to-parallel (S/P) conversion, each OFDM block processes

Ne/M complex-valued data symbols out of a sequence of Ne. Each of the M OFDM

blocks maps its Ne/M data symbols on its assigned set of subcarriers. The subcarriers

of one block should be spread over the entire transmission band-width in order to

increase the frequency diversity per block [7]. I.e, the subcarriers of the individual blocks

should be interleaved) and to split each of the sub-carriers into N signals one for each of

a plurality of antenna paths (Each of the M OFDM blocks maps its Ne/M data symbols

on its assigned set of subcarriers), wherein each of the sub-carriers is to be transmitted

over an array of N antennas using a different antenna path for each signal (not show);

a diversity agent (OFDM block see fig.1), operable to selectively apply a set of

complex weight values to each of the sub-carriers (fig.1, [page 1824-1825]), the sets of

complex weights having a complex weight for each antenna path to introduce spatial

diversity between such sub-carriers (fig.1, [page 1824-1825]); and

a transmit module (fig.1, M antennas), coupled with the diversity agent (OFDM

block see fig.1), operable to receive the modified sub-carriers and transmit the signals

to generate the multi-carrier communication channel with intra-channel spatial diversity

(fig.1, [page 1824-1825] (Each of the M OFDM blocks maps its Ne/M data symbols on

its assigned set of subcarriers)), wherein each of the set of complex weight values

include a plurality of weight values each associated with a different one of a plurality of

antenna paths of an antenna array (not show) through which the sub-carriers are

transmitted (fig.1, [page 1824-1825] (Each of the M OFDM blocks maps its Ne/M data

symbols on its assigned set of subcarriers)).

Stefan fails to specifically disclose wherein each of the sub-carriers is to be

transmitted over an array of N antennas using a different antenna path for each signal.

However, Boariu teaches wherein each of the sub-carriers is to be transmitted

over an array of N antennas using a different antenna path for each signal (col.24, line

41 to col.25, line 13).

Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made to teaching of Boariu to Stefan to reduce bit error rates

of a wireless communication in a spread spectrum receiver.

Stefan and Boariu fail to specifically disclose wherein each of the set of complex

weight values include a plurality of weight values each associated with a different one of

a plurality of antenna paths of an antenna array.

However, Buehrer teaches wherein each of the set of complex weight values

(fig.8) include a plurality of weight values each associated with a different one of a

plurality of antenna paths of an antenna array ([0091]).

Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made to teaching of Buehrer to Stefan and Boariu to improve

diversity in communication system by using Walsh codes.

Regarding claim 8, Stefan, Boariu, and Buehrer further teach a transceiver

according to claim 7, wherein the plurality of signals received from at the diversity agent

(see Boariu, item 300) are baseband signals (see Buehrer, [0091]).

Regarding claim 9, Stefan, Boariu, and Buehrer further teach a transceiver

according to claim 7, wherein the multi-carrier communication channel is comprised of a

plurality of sub-carrier signals (see Buehrer, [0091]), each having a disparate set of

complex weights introduced at a baseband of the sub-carriers to effect the spatial

diversity between the sub-carriers (see Boariu, col.24, line 41 to col.25, line 13).

Regarding claim 11, Stefan, Boariu, and Buehrer further teach a transceiver

according to claim 7, wherein the transceiver is operable to develop the set of complex

weight values for a given baseband signal to be maximally orthogonal complex weight

values applied to another baseband signal (see Stefan, [pages 1824-1825]).

Regarding claim 12, Stefan, Boariu, and Buehrer further teach a transceiver according to claim 7, wherein the transceiver is operable to develop a set of complex weight vectors for a sub-carrier (see Stefan, [pages 1824-1825]) that are substantially different from weight vectors modifying other sub-carriers that include at least a subset of information carried by the sub-carrier (see Stefan, [pages 1824-1825]).

Regarding claim 13, Stefan, Boariu, and Buehrer further teach a transceiver according to claim 7, wherein the transmit module is operable to upconvert and amplify each of the modified baseband signals to generate a plurality of spatially diverse sub-carriers (see Stefan, [pages 1824-1825], see Boariu, col.25, lines 18-32).

Regarding claim 14, Stefan, Boariu, and Buehrer further teach a transceiver according to claim 13, wherein the transmit module operable to transmit each of the sub-carriers to one or more receiver(s) (see Boariu, col.24, line 41 to col.25, line 13).

Regarding claim 15, Stefan, Boariu, and Buehrer further teach a transceiver according to claim 7, further comprising: a memory operable to store content (see Boariu, col.25, lines 33-48); and control logic, coupled to the memory (see Boariu, col.25, lines 33-48), operable to access and process at least a subset of the content to implement the diversity agent (see Boariu, col.25, lines 33-48).

Regarding claim 16, Stefan, Boariu, and Buehrer further teach the method of claim 1, wherein the multi-carrier wireless communication channel uses Orthogonal Frequency Division Multiplexing (OFDM) (see Boariu, col.12, lines 44-49).

Regarding claim 17, Stefan, Boariu, and Buehrer further teach the transceiver of

claim 7, wherein the multi-carrier communication channel uses Orthogonal Frequency

Division Multiplexing (OFDM) (see Boariu, col.12, lines 44-49).

Regarding claim 18, Stefan, Boariu, and Buehrer further teach the transceiver of

claim 7, wherein the transceiver is selected from a base station and a wireless

telephony subscriber unit (see Buehrer, [0087]).

Regarding claim 19, Stefan, Boariu, and Buehrer further teach the transceiver of

claim 7, wherein the transceiver develops the set of complex weights (see Buehrer,

fig.8) to have inter-channel spatial diversity (see Stefan, [pages 1824-1825]) with

respect to at least one communication channel of at least one other transceiver (see

Buehrer, fig.7).

Regarding claims 20 and 22, Buehrer teaches a subscriber unit comprising:

a splitter module (fig.1 S/P), operable to receive a data signal for transmission to

a receiver (fig.1, [page 1824: section A] (S/P receiving information)), to split the data

signal into a plurality of sub-carriers to at least partially redundantly transmit the

information over a multi-carrier wireless communication channel (M antennas) (fig.1,

[page 1824-1825] after serial-to-parallel (S/P) conversion, each OFDM block processes

Ne/M complex-valued data symbols out of a sequence of Ne. Each of the M OFDM

blocks maps its Ne/M data symbols on its assigned set of subcarriers. The subcarriers

of one block should be spread over the entire transmission band-width in order to

increase the frequency diversity per block [7]. I.e, the subcarriers of the individual blocks

should be interleaved) and to split each of the sub-carriers into N signals one for each of

a plurality of antenna paths (Each of the M OFDM blocks maps its *Ne/M* data symbols

on its assigned set of subcarriers), wherein each of the sub-carriers is to be transmitted

over an array of N antennas using a different antenna path for each signal (not show);

a diversity agent (fig.1, OFDM blocks), operable to selectively apply a vector of

complex weight values to each of the plurality of sub-carriers to introduce spatial

diversity between such sub-carriers (Each of the M OFDM blocks maps its *Ne/M* data

symbols on its assigned set of subcarriers), wherein the vectors the vector of complex

weight values applied to each signal ([pages 1824-1825: sections A-C]) includes a

plurality of different complex weight values (not show), and wherein each of the different

complex weight values is operable to modify both an amplitude and a phase of a

respective signal ([page 1825: section C (phase Diversity)]; and

a transmit module (fig.1, M antennas), coupled with the diversity agent (fig.1,

OFDM blocks), operable to receive the modified sub-carriers and transmit the signals

through the antenna paths to generate the multi-carrier communication channel with

intra-channel spatial diversity ([pages 1824-1825: sections A-C]).

Stefan fails to specifically disclose wherein each of the sub-carriers is to be

transmitted over an array of N antennas using a different antenna path for each signal.

However, Boariu teaches wherein each of the sub-carriers is to be transmitted

over an array of N antennas using a different antenna path for each signal (col.24, line

41 to col.25, line 13).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to teaching of Boariu to Stefan to reduce bit error rates of a wireless communication in a spread spectrum receiver.

Stefan and Boariu fail to specifically disclose wherein the vectors the vector of complex weight values applied to each signal includes a plurality of different complex weight values.

However, Buehrer teaches plurality of different complex weight values ([0091]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to teaching of Buehrer to Stefan and Boariu to improve diversity in communication system by using Walsh codes.

Regarding claim 21, Stefan, Boariu, and Buehrer further teach a transceiver according to claim 7, wherein each of the set of complex weight values are comprised of a plurality of weight values each (see Stefan, [pages 1824-1825]) associated with one of a plurality of antennae (see Buehrer, antennas 1 and 2) comprising an antenna array through which the sub-carriers are transmitted (see Stefan, [pages 1824-1825], see Buehrer, [0091]).

Conclusion

3.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to KHAI M. NGUYEN whose telephone number is (571)272-7923. The examiner can normally be reached on 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Vincent P. Harper can be reached on 571.272.7605. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/VINCENT P. HARPER/
Supervisory Patent Examiner, Art Unit 2617

/Khai M Nguyen/
Examiner, Art Unit 2617   6/4/2009